(though unrealistic) example suppose $B_2=B_3=...$ (meaning that the incremental benefit of additional competitors is the same for each extra competitor). Let us assume for the cost calculation that the COLRs would share the market equally. Then, in the optimal auction, the nth lowest bidder should be included as a COLR only if the $n-1$ lower bidders are included and the cost of the nth lowest bidder does not exceed the average of the costs of the $n-1$ lower bidders by more than a specified amount c.[13] In the interests of simplicity, one might use an "approximation" of this outcome rule by specifying that all bidders whose bids are within some amount c' of the lowest bid are included.

Generally, with more than two bidders, the form of the optimal auction depends on several things, including prominently the relative magnitudes of B_2, B_3, etc. On the basis of economic theory, it is reasonable to suppose that the benefits of additional competition decline as the number of competitors increase, that is, $B_2>B_3>B_4>....$ The theoretically optimal rule in this case depends on the likely market shares of the bidders as determined by their various costs. If one assumes that the COLRs will eventually have roughly equal market shares, the optimal rule would be to include the nth bidder as a COLR if its cost is not too much higher than the average of the cost of the $n-1$ lower cost bidders. As a practical approximation of the actual optimal outcome rule, one might set the outcome rule in an actual auction as follows.

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[13]   If the shares are not equal, the relevant comparison is between the cost of the nth bidder and the weighted average cost of the $n-1$ lower cost bidders, weighted according to the number of customers taken from each bidder by the nth bidder.

Case	Condition	Outcome
1	At least one competng bid is within 15% of the lowest bid.	All who bid within 15% of the lowest bid become COLRs.
2	No competing bid is within 15% of the lowest bid but one is within 25%.	The two lowest bidders become COLRs.
3	No bid is within 25% of the lowest bid.	The lowest bidder becomes the exclusive COLR for the area.

The parameters in this auction design – including the use of just three cases and the 15% and 25% cut-offs – are merely illustrative and not based on any detailed analysis. The illustrative rule shows how the auction is constructed to facilitate the presence of at least two actual COLRs in the market when the inefficiency from doing so, in terms of supporting a relatively inefficient competitor, are not too high. A more restrictive standard is set for including competitors beyond the second, because they are expected to contribute less to consumer welfare.

According to theory, the outcome rule described here could be used with any of several different payment rules without affecting the optimality of the auction. The payment rule, however, should be set to respect the other considerations not included in the optimal auctions model. For example, as described earlier, it is desirable to have the same level of support payments for each COLR, for that avoids creating distortions in the subsequent competition among them. One such rule would set each bidder's support payment at the level of the highest accepted bid. Yet another variation would

specify that, in case 3 only, he support payment would be set at the level of the second lowest bid.[14]

Each of these variations would change the bidders' strategic problem and lead to different levels of bids being submitted, making cost comparisons among the various rules appear difficult. One o the surprising conclusions of optimal auction theory, however, is that *contrary to simple intuition, the expected size of the support payments to the winners is unaffected by the form of the payment rules (among the set of payment rules that always produce the same set of winners)*. A rough explanation for this conclusion is as follows If one payment rule leads to systematically higher support payments corresponding to any particular bids than another rule, the bidders will offset that difference by submitting systematically higher bids for the rule that calls for the lower support payments

In practice, the proposed auction would consist of a large number of simultaneous sealed bids for the job of being the COLR. The main difficulty with this proposal is that it fails to allow bidders to account fully for "*cost synergies*," that is, for the possibility that it is cheaper to provide COLR services in one market when they are already providing COLR services in related markets. Such synergies might arise because the related markets used shared switching, transmission or other facilities.

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[14]   Another rule would specify that the support payment is the level of the highest accepted bid multiplied by 1.15 in case there are two winners and by 1.3 in case there are three or more winners. Again, the percentages are arbitrary and intended for illustrative purposes only. What is illustrated is that the payments can be made to depend on the number of COLRs selected.

However, permitting combination bids would add significantly to the complexity of the auction design, which is quite important given the possibly large number of small auctions to be conducted. To evaluate the potential benefits of combination bids, one needs to assess the importance of cost synergies.

The need for COLRs arises only in markets where it costs more to serve some potential subscribers than the established maximum basic service rate. If these high cost customers are subscribers who are distant from a town center, then the main cost complementarity may be between serving customers close to town and those at a greater distance from the town center. In that case, if service for the core town will be established anyway, then there are no important cost complementarities in serving two outlying areas bordering the town. If the core town will be served by the COLR in any event, then the model used to study the optimal auction adequately characterizes the basic auction design problem.

However, it may be the case that the bidder, possibly not the LEC, fails to win the COLR designation for the core town and rates for basic service are so low that support payments are required for service to all the potential subscribers in a particular town or other geographic area. In this alternative scenario, a firm's decision to provide any service to the area may depend on its ability to acquire business in the town core, or even throughout the related areas. If the relevant areas are the same for all bidders, one might try to avoid the problem by specifying larger areas for the universal service obligation. However, different customers within any large area may have very different costs of establishing service. That creates a problem as the COLRs avoid offering

service to the highest cost customers. This "cherry picking" problem is discussed in more detail in the next section. Even without cherry picking, if the areas with synergies vary among bidders, then the way the areas are carved up is another tricky problem that needs to be resolved in the auction. These cases, which may be called the cases of "*complex cost synergies*" are the most difficult ones for simple auction designs to treat successfully.[15]

My central proposal s based on the presumption that complex cost synergies are of secondary importance, especially in areas where there are to be multiple COLRs, and that it is not worthwhile to adopt the more complex auctions necessary to account fully for cost synergies. In n y judgment, the complexity of the combinatorial auction in this context are even greater than was found to be the case in the PCS spectrum auction. Partly, this additional complexity arises from the need to provide uniform pricing in each separate market after the auction, and partly it derives from the very large number of small areas that need to be combined. This complexity suggests that such combinatorial bidding schemes should only be considered where the strength of the synergies means the likelihood of very inefficient outcomes from any non-combinatorial scheme is very high. Even in that case, one might first consider the use of a simultaneous multiple round auction, weighing the risk of collusion against the desire to allow bidders to assess the values of combining service areas.

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[15] In the paging, PCS, and SMR auctions, besides any cost synergies, there were important additional synergies from demand side effects. Buyers of PCS services, for example, find the service more valuable when the phone works over a wider

In the next section, to account in a highly imperfect way for cost synergies, I will propose a rule allowing winning COLRs to withdraw bids. The ability to withdraw bids allows the potential COLRs to avoid being forced to provide service in a patchwork quilt of geographic areas. These proposed withdrawals will be subject to penalties, as in the spectrum auctions, to discourage frivolous bidding

III. The Proposed Auction Mechanism

In this section, I outline the major components of an auction for the COLR designation, motivated by the previous discussion of optimal auctions. The kind of auction I propose is in some important respects similar to the kind of auction that GTE has recently proposed to the FCC and other state PUCs.

In summary form, the auction would be conducted as follows. Auctions would be conducted twice annually on specified dates. For each *Census Block Group* (CBG), the FCC or state PUCs would first establish a maximum support rate (the "*reserve*") based on a multiple of the predicted cost under an adopted cost model.[16] A notice process in

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geographic area. In contrast, there appear to be no important demand side synergies in meeting universal service obligations.

[16] A multiple greater than 100% of the estimated cost should be used, with the extent of the mark-up dependent on the amount of error in the cost estimates. The mark-up is needed to compensate for "*selection bias*": auctions will be most likely to be conducted for those areas where the model overestimates the costs and will be least likely where the model underestimates the costs. Consequently, a simple 100% rule would leave the LEC receiving the model cost estimate most often when the model most underestimates the actual cost. A reasonable allowance for upward movement also needs to be made when an area is reauctioned to allow for changes that may increase costs over time, such as a change in the definition of the "core" service.

which potential bidders nominate areas in which they are interested in providing service would fix the CBGs for which COLR obligations are to be auctioned. Those making nominations would be required to establish their qualifications to satisfy the COLR obligation. If a party indicates an intention to bid on one particular area for an auction, other parties may nominate additional adjacent areas to auction with that particular area. On the auction date, sealed bids would be submitted indicating the support levels that the bidders require.

In the initial auction for each area, if there are no bids submitted at or below the reserve, the LEC is designated the COLR at an "official" support level determined by the FCC or state PUCs and based upon a cost model (such as the BCM or CPM).[17] This would be treated as if no auction had transpired and the are would remain eligible to be noticed for auction.

Once a new COLR (instead of or in addition to the LEC) has been established in any CBG, the obligations would be fixed for a period of three years, subject to performance standards. After the initial three year term, any qualified entity could notice the area for an auction. If no one notices these areas then the incumbents would continue to receive the same level of support payments but without extending the period of protection.

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[17] If the LEC believes that the official rate is too low, it may seek a higher rate from the FCC or state PUC. Of course, the higher rate may encourage other potential COLRs to petition for an auction of some or all of the LEC's COLR service areas.

In order to mitigate the complex cost synergies problem described earlier, I suggest that any bidder be permitted to withdraw its bid from one or more areas. If a bid is withdrawn, the outcome of the auction will be determined as if the withdrawn bidder had never participated in the auction for that area. To discourage frivolous bidding and withdrawals, the FCC and/or state PUCs should establish withdrawal penalties similar to those adopted for the PCS auctions. The penalty might be equal to the larger of any increase in (e.g.) the twelve month support obligation of the government as a result of the withdrawn bid or, say, $20 per subscriber in the CBG.

In what follows, I describe how these components will serve to ensure that the objective of providing universal service is efficiently attained.

a.   The size of the service area.

It is very difficult, if not practically impossible, to define service areas that are homogeneous in terms of the costs of serving subscribers. Heterogeneous costs in a single service area lead to several costly effects. First, the COLRs may have an incentive to avoid serving the higher cost subscribers and to focus their marketing efforts solely on the relatively low-cost subscribers.[18] This problem is compounded when there is competition among COLRs, each of whom may hope to force its

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[18]   In general, if an area is sufficiently homogeneous, the COLR will find this kind of discrimination unprofitable because (1) even a subscriber that is more expensive to serve than the average subscriber may make a positive contribution to covering the system's fixed costs and (2) when the heterogeneity is not too great, the cost of discriminating between relatively high- and low-cost subscribers may exceed the profit from successful discrimination.

competitors to serve the subscribers for whom costs are highest. Second, support payments distort competition between COLRs and non-COLRs to serve subscribers for whom service can be provided at relatively low cost. The more heterogeneous the costs of service in an area, the worse these problems are likely to be. Smaller service areas therefore tend to reduce these costs.

An additional advantage of small service areas is that different service providers can assemble groups of areas that fit their technological capabilities. Larger service areas that include geographic areas outside the reach of a potential entrant may dissuade the entrant from bidding.

In economic terms, the choice between small and large service areas is governed by a comparison of the costs of cherry picking plus the costs of the monitoring and regulation needed to mitigate it, the costs of conducting auctions for a multitude of small areas, and the tendency of large service areas to block entry by some service providers. GTE has proposed the use of CBGs (which are quite small service areas) to control the costs of cherry picking and its regulation. If adopted in combination with my proposal for relatively simple, inexpensive sealed bid auctions, the package would constitute a coherent and workable plan for developing market competition.

Question 58 in the Commission's Public Notice asks whether wire centers rather than CBGs should be used as the basis for cost projections. The considerations already discussed above suggest that wire centers have two disadvantages. First, they are relatively large, encouraging cherry picking. Second, they are a natural area only for the

incumbent LECs. A new ent ant might be able to serve many CBGs but unable to serve the entire wire center, giving the LEC an artificial cost advantage in serving as the COLR. The use of CBGs would be technologically neutral because the definition of a CBG is unrelated to the pro vision of telephony. Thus, the use of CBGs would tend to avoid the possibility of biasi ng the auction outcomes towards one technology (or one incumbent).

      b.   One-shot sealed bids.

The simultaneous multiple-round auction format used in the FCC's spectrum auctions has a number of advantages. Foremost among them is that it permits bidders to take into account the possibilities of substitutability and complementarity among the licenses for which they bid and to adopt back-up strategies (for example, to acquire substitute licenses) in case their primary strategies fail.

In theory, the simultaneous multiple round format should be particularly good at accounting for substitutes, and the FCC experience has borne that out. In the paging auctions, for example, some bidders switched between bidding on the high capacity 50/50 licenses and the lower capacity 50/12.5 licenses during the auction to account for the changing levels of bidding activity. Similarly, in the PCS A and B block auctions, bidders frequently switched between the very similar A and B blocks, substituting between them. The simultaneous design also has important advantages over the sealed bid design in dealing with complementarities when those are important.

Substitution and "back-up strategies" are likely to play much smaller roles in the COLR auction than in the spectrum auctions, because the COLR obligations to service various areas are not technological substitutes. As in the PCS auctions, some substitution possibilities could be generated by a firm's service capacity limitations. Limited budgets could also lead bidders to seek a limited number of COLR obligations. However, the important technological substitution possibilities will be missing.

As against these advantages for the simultaneous multiple round auction, the sealed bid auction has advantages of simplicity and reduced vulnerability to collusion. Any pre-auction collusive agreement among bidders will tend to collapse in the sealed tender auction proposed here because each bidder has a straightforward and powerful incentive to defect from it.

Even if collusion were not an issue, the costs of administering a simultaneous multiple round auction for both the regulator and the bidders may not be worth the benefits. In the PCS auctions, the values of the individual licenses were substantial in comparison to the administrative costs of running the auction and the problem of collusion appears to have been of minor importance. The benefit-cost analysis in this case thus looks quite different than that of the PCS auctions.

     c.   Determining the support paid to winning bidders.

According to the optimal auction analysis in section II, if the bidders respond "rationally" and competitively to one another's strategies, then a variety of rules can be used to determine the support payment without affecting the efficiency of the overall

design. Choices among these support rules must therefore be determined by factors apart from those built into the optimal auction model. These factors include (1) the ease or difficulty for bidders of determining their best ("rational") bid, (2) the vulnerability of the rule to collusive behavior, and (3) public perception of the rule as fair and reasonable.

Among the payment rules that might be acceptable according to the optimal auction theory are: (1) the payment is set equal to the lowest rejected bid or to the reserve if all bids are accepted and (2) the payment is set equal to the highest accepted bid. The first of these rules performs poorly in the public perception (as the experience of the New Zealand spectrum auctions demonstrates) and is vulnerable to some collusive bidding patterns. The second rule is readily perceived as fair and reasonable, since it allows the bids to be interpreted straightforwardly as the lowest level at which the bidder offers to supply service. For that reason, I favor it.

      d.   The number of COLRs.

I would propose that the Commission permit the designation of multiple COLRs for any particular area, the number depending on the differences in the bid amounts. Lacking any quantitative basis for the assignment rule, I tentatively propose the rule described in the previous section. To repeat, that rule is as follows.

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[19]   If the reserve is known to the bidders to be very high, there is a Nash equilibrium in which the bidders each bid zero and receive the reserve as their subsidy. This outcome leads to the same kinds of losses that we identified earlier for other forms of collusive behavior.

Case	Condition	Outcome
1	At least one competing bid is within 15% of the lowest b d.	All who bid within 15% of the lowest bid become COLRs.
2	No competing bid is within 15% of the lowest bid but o le is within 25%.	The two lowest bidders become COLRs.
3	No bid is within 25% of the lowest bid.	The lowest bidder becomes the exclusive COLR.

There are three adv intages of a rule such as this. First, it encourages competition within the mark et for the patronage of potential subscribers. Second, the presence of multiple COLF s may ease the Commission's burden of monitoring and enforcing the performance of the COLRs after the auction, for several reasons. If some COLR is tempted to avoid serving the highest cost subscribers in a service area, the other COLRs will be led to detect and report that in order to avoid being forced to serve a disproportionate share o those subscribers Multiple COLRs also provide the regulatory authorities an o portunity to compare the performance of several COLRs in the same market, making easier to detect false claims about the impossibility of providing some promised ervices. Moreover the Commission's threat to impose sanctions, including possible termination of a company's COLR status, is more credible if there are alternative CO Rs available to protect consumers against service disruptions.

Third, the approach I have proposed accounts for both the declining benefits from designating multiple COLRs and the cost increases that may accompany a larger

number of COLRs. When the bids of the participants are relatively close, the cost

disadvantages from multiple COLRs will be correspondingly small, resulting in greater

net benefits from multiple COLRs. In this case, the rule would designate multiple

COLRs. When the cost differences are larger, the net benefits from multiple COLRs will

be smaller, and the proposed rule would limit the number of COLRs designated.

  e. The "official" reserve and the auction initiation.

For each CBG, the Commission should establish a maximum support level or

"reserve" equal to the difference between the standard rate for the basic service

package and a multiple[20] of the cost estimate of providing that package based on an

estimation model such as the CPM or BCM. The primary purpose of the reserve is to

limit the required support payment in areas where only the LEC can provide economical

service. However, the ceiling created by the reserve will also encourage somewhat

lower bids in the auction.

After the official reserves have been set, the Commission (or the state PUCs)

should allow bidders to nominate CBGs for inclusion in the next auction. This could be

done by asking interested parties to submit a Notice of Intent by some specified date

before each auction. If the auction for a particular CBG attracts any valid bids from any

bidder besides the incumbent LEC, the auction is held; if it attracts no bidders or if only

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[20] As I have already explained, the reserve needs to be based on a multiple of the estimated cost in order to allow the auction to correct errors – both overestimates and underestimates – in the cost estimates and to mitigate the "selection bias" that would be otherwise created.

the incumbent LEC submits a valid bid, the incumbent would retain the COLR

obligations at the previously established support level based on a multiple of estimated

costs.[21] Similarly, in any area where an auction has not yet been held, the incumbent

LEC would retain the COLR obligation at the previously established support level.

For those CBGs for which auctions are held, the designated COLRs would be

obliged to provide service beginning, say, one year or eighteen months after the COLR

designation. This delay is to permit new entrants whose business plans call for

additional facilities investments to make those investments after winning in the auction.

This encourages the widest feasible participation in the auction.

> f.   Exploiting synergies in adjacent CBGs and withdrawal penalties.

Participants in the auction may bid on as many CBGs as they choose, thus

permitting bidders some limited flexibility to account for economies of density and scale

in their CBG-specific bids. Thus, if a particular entity bids for only one CBG and there

are scale and density economies in serving that CBG and adjacent CBGs, then another

entity can underbid the first entity in the one-shot auction format.

Some winning bidders may discover after the auction that the aggregation of the

particular CBGs won would not permit the bidder to attain all of the expected synergies.

This is likely to be a serious problem only if both of the following two conditions apply:

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[21]   Any other rule would allow a non-COLR to affect the support price in an area
merely by nominating a CBG for auction and without actually bidding, possibly
encouraging mischievous nominations.

(1) the bidders' overall cost evels are similar and (2) the synergies are strong. The first condition makes it more like y that each bidder wins a COLR role in several areas, which is a pre-requisite for t ie problematic "checkerboard pattern," and the second is necessary for the consequences to be economically costly. To help remedy this problem when it is most sevrere, I propose that a winning bidder be permitted to withdraw its bid for some pe riod after the auction. In effect, a bid withdrawal substitutes partially and quite imperfec ly for combinatorial bidding.

When a winning bidder withdraws its bid for a CBG, the auction outcome would be determined by the rema ning bids as if the withdrawn winner had never bid. (If only the incumbent LEC remain s as a bidder, the auction is canceled, and the incumbent LEC receives support payr ents at the previously determined level.) This rule prevents any participant from using withdrawals strategically to trigger a new auction, thereby effectively turning a one-sh ot auction into a multiple-round auction.

Although withdrawais should be permitted, they also need to be penalized. There are two important reasons First, the withdrawals may disrupt the outcome of the auction and the plans of o her bidders and so need to be discouraged. Second, the lack of any penalty may encou age frivolous bidding, in which the bidder attempts to assemble unrealistic comt inations or tries to mislead competitors about its future intentions. If there are no)enalties, this sort of disruptive bidding behavior is riskless to the bidder.

To assist in mainta ning the integrity of the auction, I would propose that the Commission establish mc derate withdrawal penalties to deter frivolous bidding, as it did

in the PCS auctions. To determine the withdrawal penalty, the Commission would assume that in the future, the winning COLRs would have equal market shares in the CBG. The penalty for a withdrawn bid might be equal to the larger of any increase in the twelve-month support obligation of the government as a result of the withdrawn bid or, say, $20 per subscriber in the CBG. The penalty protects the government from any increases in its support costs and provides some compensation for any loss in post-auction competition resulting from the frivolous bid.

g. The length of the COLR designation

The length of the time period for which an entity is designated a COLR has several effects. First, a long period ensures that what a bidder wins by making a low bid is of significant value. Second, the period affects the pattern of investments that may be undertaken to provide COLR services.

Encouraging efficient investment is a subtle matter. Optimal investments require that today's COLRs properly anticipate the likelihood that superior technologies will become available tomorrow, replacing the COLR or cutting into its profit margins. Setting too long a period of protection discourages or even blockades entry when the new technology becomes practically available. Setting too short a period may require large initial support payments to allow the investor to recover its investment in a short period. Such support payments may exceed the reserves or be embarrassing to the regulator.

To balance these competing concerns, I have tentatively proposed a three year period for the COLR obligation. To account for cost increases during the interim, the Commission could periodically raise the support rate by an exogenous index of costs, in the same way that the Commission currently implements its price cap policies.

Further, to allow new entry to occur when it is ready, the three year period of protection might not apply to auctions in which the set of COLRs serving an area does not change, or changes by the exit of a COLR. The three year period of protection would then apply only when a new COLR is introduced into the group serving a particular CBG. The justification is that only a new COLR might be regarded as needing an initial period of predictable competition during which it amortizes its investment.

At the end of the three year period, the areas for which the COLRs were selected via an auction would be eligible to be nominated by qualified parties for a new auction. The rules for these auctions would be nearly identical to those for the original auctions, but taking into account that the COLR for an area may no longer be the LEC. Simply put, the FCC (or state PUCs) would once again announce an official reserve and call for bidders. If no notice of intent is received for a CBG or if there are no valid bids for it, then the incumbent COLRs retain the obligation to provide basic service at the original support rate.

h.   Default penalties.

If a bidder defaults the outcome could be determined as if there had been a withdrawal, as discussed above. However, the costs to the government and consumers

will be more substantial the onger the time between the initial auction and the default. This is because the plans o other potential COLRs may have been seriously affected. Consequently, any replacer ent for the defaulted COLR is likely to demand a higher support level for the shorter term obligation than for the initial obligation.

Because the COLRs are likely to be parties with continuing relations with the regulators, there are many ways for the Commission to discourage default. The Commission should explore whether it may modify any of its current regulatory penalties for the purpose o deterring the default of a COLR.

i.   Transferabilit of the COLR obligation

As already noted, the proposed auction mechanism has only a limited ability to accommodate synergies ir service provision across CBGs. To permit COLRs to realize greater economies after having some experience with the COLR obligation, I would permit a COLR to sell its COLR status to any other qualified company (for example, one that is a COLR in some CBG) that is a non-COLR in that particular CBG. That is, sale would permitted be to a qualified firm (as evidenced by its COLR obligations elsewhere) provided it does not reduce the number of competing COLRs in the affected service area.

Permitting the COLR to sell the obligation after the auction also permits a bidder whose costs are unexpectedly high to transfer the obligation to a more efficient provider.

Excerpt from

An Auction Mechanism for Determining Universal Service Support

Dennis Weller
Chief Economist
GTE

Rutgers University
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2.   The Carrier of Last Resort Obligation

In the past, the regulator has been able to rely on the incumbent as the "carrier of last resort" ("COLR"). It ould require the incumbent to serve any customer on request, and could establish prices, terms, and conditions as needed, through its pervasive regulation of the ncumbent, to meet its policy needs. This asymmetric requirement would appear o be incompatible with a competitive market. They represent a burden on the ncumbent that other carriers do not share. To the extent that the required prices an terms could be sustained, they would be a barrier to entry; to the extent they could no the universal service objective itself would not be achieved.

At first blush, it wou d appear that the way to deal with the problem is to eliminate the carrier of last resort ob igation, and to simply distribute funding from a new mechanism to all carriers. However, after some more thought, I have come to the conclusion that linking sup ort to an obligation to serve is in fact an efficient design, given a real world of limite information. This is so because customers are heterogeneous.

Evidence from recently developed cost models suggest that the cost of providing local service varies dramatically from one place to another. Even within a small rural town, the cost of a custom er on the main street may be an order of magnitude less than the cost of a farmer sever al miles outside of town One tool for dealing with this variation is to calculate su port amounts for geographic units which are relatively

small.[1] However, even with n a small area, some variation in cost will remain. Further,

customers will differ with respect to other variables of interest to a prospective local

carrier, such as their demar d for other services (toll, vertical services, video, etc). It is

useful to think of an orderin g of customers according to their attractiveness to a carrier.

This could be expressed in terms of the amount that would be required, as a side

payment from the regulator to induce an efficient provider to serve a given customer at

the price and terms the reg Jlator wishes to maintain.[2]

Given perfect information, the regulator could simply announce, for each

customer, the amount of si pport -- the side payment -- that would be just sufficient.

This would obviate the need for any obligation to serve, since supply would be

forthcoming on a voluntary basis for every customer. Unfortunately, the regulator does

not have perfect informatic n, and must therefore make do with some average level of

support for all of the custo ners within a given area. If carriers receiving such support

are able to serve selective y, then not all customers will be served. The only way to

ensure supply for all custc ners in an area would be to set the average support amount

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[1] For example, several of the proposals in the US are designed around a standard
unit reported by the US Census Bureau, which is called a census block group, or
CBG. The boundaries of each CBG are chosen to encompass from 200 to 500
households. Except in the most rural areas, these units are usually small enough
to capture differences in cost between town centers and outlying areas. Another
model, developed by Pacific Bell, has been built around "grid squares", each of
which is 1/100th of a degree, or about 3,00 feet, on a side. Because these "grid
squares" are constan in size, they may provide improved precision in rural areas.
In the state of California, for example, about one third of the grid squares have no
households at all.

[2] Note that, since the cost of serving each customer is not independent, neither
would be the amount of the required side payment.

at the level carriers would require to serve the least desirable customer in the ordering.
This would be expensive, since the regulator would pay too much for all but one of the
customers.[3]

The carrier of last resort may therefore be seen as performing an averaging
function for the regulator. The regulator "bundles" heterogeneous customers in an area
together, and announces an average support amount for a carrier willing to serve any of
them. In effect, the regulator delegates its information problem to the COLR. There is
a limit, however, to the degree of heterogeneity that is reasonable to expect this
structure to deal with; if the range is too great, the COLR will not be able to sustain its
obligation in the face of entrants who are not so encumbered, nor will the regulator be
able to police the COLR effectively to avoid shirking. For this reason, I believe that the
carrier of last resort obligation should be assigned, and the support level set, for small
geographic areas.

In the past, there has been only one carrier of last resort -- the incumbent. There
has been considerable debate on the issue of how many carriers should be designated
as COLRs in a new universal service plan designed for a competitive market. Several
alternative structures could be adopted in a new universal service plan:

1) The regulator could continue to designate the incumbent as the sole COLR.
This would not appear to be consistent with the objectives of the plan.

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[3]   It is of course quite possible that all customers in an area may be attractive to serve
without support; the market price may be less than the "affordable" price set by the
regulator.

2) Some method, such as competitive bidding, could be used to select a single COLR. This would permit a priori competition for the market among prospective candidates for the COLR designation. However, it could limit ex post competition in the market, since support would be available to only one carrier. Of course, other carriers would be free to enter, and to provide packages of service to selected customers without support.

3) Support could be provided to more than one COLR, each of which would be obligated to provide the basic service on request to any customer in the area. The support could then be provided on a per-customer basis, so that support would be distributed among the COLRs by the customers' own choice of carrier. This would allow the COLRs to compete in the market ex post on an equal footing. It would also eliminate the possibility that the provision of support to a single COLR would deter entry by another efficient provider.[4] On the other hand, provision of support to several COLRs could induce inefficient entry, and thus raise the cost of supply in the market generally.

4) All carriers in the market could be treated as COLRs. I do not believe that this option is attractive, since t would establish an obligation to serve as a condition of entry. Thus would effectively force all firms to be ubiquitous providers, and would preclude niche entry.

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[4] The probability that an efficient carrier would be deterred would depend on the size of the market intervention the regulator decides to impose, and hence on the magnitude of the necessary support.

Option 2 would appe ar to be preferable to option 1, since it would at least ensure a priori competition for the r ght to be the COLR. Option 3 would, in addition, promote more effective ex post com petition among the COLRs, at the possible cost of some inefficiency of supply.

Option 3 would resu t in a sort of two-tier market. Anybody can enter and provide any kind of service under whatever minimal regulation the regulator decides to apply to all carriers. All of these carriers are treated alike. A subset of these chooses to perform a specific functi n defined by the regulator -- serving as carrier of last resort -- for which each is comper sated by an average amount per customer served in the (small) area.[5] All of these COLRs are also treated alike. This scheme is thus as symmetric as it can be an still employ a COLR obligation.

It is useful to think f the COLRs simply as suppliers who perform a specific function the government v ants done, and are compensated at a market level for doing so. Viewed in this way, the COLRs are no different from many other vendors who enter into contracts to supply se rvices to the government. Government agencies can, and often do, select multiple s ppliers for a contract; but other firms can enter the market and do business without t ecoming such a vendor.

The risk that this s stem will bias the market outcome can be minimized if the symmetry I have describe d is maintained, if the COLRs are self-selecting, and if the level of compensation ca be set as closely as possible to the level that would be

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[5] Note that the use of mall areas, besides limiting heterogeneity, also minimizes the size of the obligation an entrant must take on to qualify for support.